# THE ANALYST.

JANUARY, 1892.

## PROCEEDINGS OF THE SOCIETY OF PUBLIC ANALYSTS.

A MEETING of the Society of Public Analysts was held on the 2nd December, 1891, the President being in the chair.

The minutes of the last meeting were read and confirmed.

The following gentlemen were duly proposed :—

As members :—Dr. Samuel Rideal and Mr. James Nimmo.

As associates :—Messrs. Charles M. Caines and W. P. Skertchley.

Dr. William Robert Smith was duly elected a member, and Mr. E. H. Roberts an associate of the Society.

On the motion of Mr. Harvey, seconded by Mr. Woosnam, Messrs. Harland & Coste were elected Auditors for the year.

The following paper was then read by the author:—

### NOTE ON TABARIE'S PROCESS FOR THE INDIRECT ESTIMATION OF ALCOHOL IN BEERS.

BY SYDNEY HARVEY.

THE alleged discrepancy between the indirect and the distillation methods for the estimation of alcohol in beers has for some time engaged my attention, and I have been trying to determine the amount of difference between the results yielded by the respective processes, and, if possible, arrive at the cause.

The following investigation was conducted upon four series of sound new beers with a minimum of acidity; and the plan adopted in every case was uniformly as follows :—

The samples were well shaken to expel as much as possible the carbonic acid gas; 200 c.c., exactly measured; slightly diluted with water and subjected to distillation, nearly 150 c.c. being drawn over. This distillate was made up to 200 c.c., as was the "extract" left in the retort; the densities of both these and also that of the original beer being carefully taken. The results were as follows :—

*Average Specific Gravities at* 60° F. *from* 4 *sets of Beers analysed.*

| | Beer. | Extract. | Alcohol Calculated. 1—(E—B) | Alcohol by Distillation. | Difference. |
|---|---|---|---|---|---|
| 1. | 1·01131 | 1·01934 | 0·99197 | 0·99167 | 0·00030 |
| 2. | 1·00826 | 1·01653 | 0·99173 | 0·99119 | 0·00054 |
| 3. | 1·01608 | 1·02435 | 0·99173 | 0·99137 | 0.00036 |
| 4. | 1·01971 | 1·02739 | 0·99232 | 0·99189 | 0·00043 |
| | | | | | Average Difference 0·00041 |

Referring to the above, the distillation process will in every case be found to yield an alcohol of lower density than by Tabarie's method; and this has been my constant experience. I think this somewhat remarkable, because at first sight one would suppose that the reverse would be the case, owing to *possible* loss of alcohol during evaporation and subsequent condensation.

That experiments conducted upon solutions of alcohol, pure sugar and water, when treated as above *do* yield identical results by either process, has, I think, been fully proved when the subtraction formula is applied.

The case of a complex fluid like beer, however, is not a parallel one, owing to the presence of carbonic acid—present in the beer, but absent in the "extract." Clearly these two liquids to be strictly comparable should differ but in one respect, viz., the presence or absence of alcohol only.

The four series of beers above referred to were carefully examined for residuary carbonic acid, with the result that a pretty constant amount was found, averaging 0·1 gramme of $CO_2$ per 100 c.c., and never much under that quantity.

Before, however, claiming this carbonic acid as a factor in raising the density sufficiently, its effect upon water had to be ascertained, and as I could not find any published matter on this question, I resolved to investigate the subject myself. I charged distilled water with washed carbonic acid gas, and after numerous failures, owing to the troublesome disengagement of bubbles of gas in the specific gravity flasks, I at length arrived at the following results:—

*Specific Gravity of Solutions of* $CO_2$ *in Water (distilled).*

| Grammes per 100 c.c. | Sp. Gravity. | Grammes per 100 c.c. | Sp. Gravity. |
|---|---|---|---|
| 0·02 | 1·00009 | 0·12 | 1·00044 |
| 0·04 | 1·00017 | 0·14 | 1·00049 |
| 0·06 | 1·00024 | 0·16 | 1·00055 |
| 0·08 | 1·00030 | 0·18 | 1·00061 |
| 0·10 | 1·00038 | 0·20 | 1·00065 |

I submit the above with great diffidence. The work was beset with sources of error, but I believe the figures to be near the truth; and I think that they prove two things:—1st, That carbonic acid raises the density of water; and 2nd, That it does do so to just the extent (allowing for experimental error) required to reconcile the two processes in question, for as the average $CO_2$ in the above series of beers is 0·1 gramme in 100 c.c., this would raise the gravity of water to 1·00038. The excess of this latter above unity should be added to the "extract" gravity before applying the formula, when the alcoholic strength, as ascertained by the two processes, will be practically identical.

For further proof I treated two more series of beers as before, previously endeavouring to expel all $CO_2$, or as much as possible. The samples were shaken, and exposed to the vacuum of an air pump repeatedly. The following were the results:—

*Specific Gravities at* 60° F. (*all average figures*).

| No. | Beer. | Extract. | Alcohol by Tabarie. | Alcohol by distillation. | Difference in favour of Tabarie. |
|---|---|---|---|---|---|
| 5. | 1·01401 | 1·02206 | 0·99195 | 0·99197 | 0·00002 |
| 6. | 1·01943 | 1·02767 | 0·99176 | 0·99178 | 0·00002 |

The $CO_2$ in all the above samples averaged less than 0·022 grammes per 100 c.c., equivalent to a density of 1·00009 or under.

These results are in my opinion fairly satisfactory, and go to show that by the complete, or nearly complete, expulsion of the carbonic acid in beer, the direct and indirect processes for the estimation of alcohol therein fairly agree, and that the formula $1 - (E - B)$ may be safely applied.

In conclusion I have pleasure in acknowledging the assistance of my pupil, Mr. Horace Cox Wheeler, throughout my work.

### Discussion.

The President remarked that Mr. Harvey had not adopted the Tabarie method, that is to say, the division method, but had used the subtraction formula, which the text-books contended was wrong. He (the President) had calculated, from Mr. Harvey's results, the specific gravity of alcohol by division, and found that the division formula in every case gave results further from the truth than did the subtraction formula, thus confirming Mr. Blunt's contention, which had been endorsed by himself (Mr. Hehner).

He hoped that the outcome of this and the previous discussion on this subject would be the working out of a really correct formula. It was evident that neither of those now in use were based upon real mathematical principles; and what they had to aim at was a really correct expression of what the relation between the specific gravities before and after boiling was to the quantity of alcohol present.

Mr. Harvey replied that he was practically ignored the division formula because he could not find sufficient proof that its results were reliable. His own experiments had

been confined entirely to beer. Whilst admitting that there was little hope of the question being absolutely solved, he might say that at one time he expected that the extract itself might suffer some change and loss of density consequent upon the boiling in order to obtain the alcohol. He had made experiments to prove that by boiling measured quantities under efficient condensers; but, after hours of boiling, he found that the gravity remained unchanged, so that the matter was not susceptible of proof in that way.

Dr. Sykes remarked that there could be no doubt that the "extract" of a beer did undergo a change of gravity by being boiled in an open beaker, since a turbidity or even a deposit formed. In the distillation process, which was conducted out of contact with the atmosphere, the residue in the retort was bright and clear.

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## THE ADULTERATION OF BASIC SLAG.

By Bernard Dyer, *B.Sc.* (*Lond.*)

In The Analyst for December, 1891, (Vol. xvi., p. 236), there appears an abstract of a paper by Morgen, which deals with the detection of the adulteration of Basic Slag with Redonda Phosphate (phosphate of alumina).

The use of caustic soda solution (originally suggested, I believe, by Richter, Landwirthschaft: Annalen XXXV., 1890), is referred to; but the statement is made that "the best method for the quantitative examination of basic slag consists in treating the sample with a 5% solution of citric acid, *in which the phosphoric acid natural to the slag is completely soluble, while that of the Redonda phosphate is not dissolved.*

Both these statements are erroneous, and are likely to lead to confusion if relied upon.

It is true that *raw* Redonda phosphate is only slightly soluble in 5% solution of citric acid, in the case of a rapid treatment, although the solubility is considerable if the treatment is prolonged. *Calcined* Redonda phosphate, however, dissolves to a very considerable extent, and it is calcined Redonda phosphate that is likely to be used. Thus, in an experiment I made, four and a-half per cent. of phosphoric acid was dissolved from calcined Redonda phosphate by cold 5% citric acid solution, standing over night, while by using a warm citric acid solution (about 60°C.), 16% of phosphoric acid (almost half the phosphoric acid present) was dissolved in two hours.

On the other hand, from a finely ground basic cinder, containing 18% of phosphoric acid, only 11% was dissolved during the night by cold treatment, and only 14½% by treatment in the warm for two hours.

Although, therefore, there is no question that the phosphoric acid of basic slag is more readily soluble in 5% citric acid solution than that of Redonda phosphate, there is no such difference between them in this respect as would form the basis of a reliable qualitative test, and any attempt to take advantage of the difference for quantitative purposes is obviously hopeless.

PAPERS READ AT MEETING, NOVEMBER 4TH, 1891.

## NOTE ON TABARIE'S METHOD OF DETERMINING ALCOHOL.

By Alfred H. Allen.

Some time ago Mr. Thomas Blunt pointed out to me the anomaly of Tabarie's formula for determining alcohol from the extract gravity of the sample, and suggested a formula which he thought would be preferable. In order to throw further light on the matter, I requested Mr. Robert Waterhouse to make a series of experiments. The investigation was interrupted, but the following results were obtained. A sugar solution was made by dissolving 20 grammes of cane sugar in water, and making up the solution to 100 c.c. The specific gravity was carefully taken, and then accurately measured portions of the solution were mixed with (1) an equal measure, (2) a half measure, and (3) a double measure of rectified spirit of exactly ascertained gravity. The volume of the mixture was observed, after which a known measure was distilled off, and the gravity of the distillate taken, while the extract was diluted to its original volume and its specific gravity also observed.

The following results were obtained:—

| | Expt. 1. | Expt. 2. | Expt. 3. |
|---|---|---|---|
| Measure of sugar solution taken ... | 50 c.c. | 33 c.c. | 67 c.c. |
| Measure of spirit taken ... ... | 50 c.c. | 67 c.c. | 33 c.c. |
| Measure of mixed liquid ... ... | 97·9 c.c. | 98·4 c.c. | 98·4 c.c. |
| Specific gravity of mixed liquid ... | 0·9764 | 0·9299 | 1·0149 |
| Specific gravity of extract ... ... | 1·0400 | 1·0227 | 1·0526 |
| Absolute alcohol calculated from known composition of mixture | 38·25 % | 53·59 % | 24·16 % |
| Alcohol calculated from specific gravity of distillate ... | 39·16 % | 54·19 % | 24·59 % |
| Alcohol calculated from specific gravity of extract— | | | |
| By Tabarie's formula: $\frac{L}{E} = S$.* | 40·40 % | 53·91 % | 25·86 % |
| By Blunt's formula: $1000 - (E - L) = S$. | 41·60 % | 54·86 % | 27·22 % |

I give the results obtained in the third experiment, but there were sources of error which prevent me from laying much stress on the figures.

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## NOTES FROM THE KHEDIVIAL LABORATORY, CAIRO.

By H. Droop Richmond.

1. **The Relation between Specific Gravity, Fat, and Solids not Fat in the Milk of the Gamoose.**—In the researches on the milk of the Gamoose, made by Mr. Pappel and myself, we found that the formula I had worked out for cows' milk was not applicable. I have, therefore, worked out one to express the results obtained

* Where L = specific gravity of liquid; E = specific gravity of extract; and S = specific gravity of spirit, from which its strength can be ascertained by a table.

in the analyses of Gamoose milk; the methods and reasoning employed were exactly the same as those indicated in a former paper (ANALYST xiv., 121). This formula is $T = \cdot 27\frac{G}{D} + 1 \cdot 191\ F$. I have also applied the formula for calculating proteids and sugar given in the ANALYST (xv. 170), $P = 2 \cdot 8\ T + 2 \cdot 5\ A - 3 \cdot 33\ F - \cdot 7\frac{G}{D}$ to the milk of the Gamoose with satisfactory results.

The following table shows the agreement between the fat proteids and sugar found and calculated respectively:—

| | G | $\frac{G}{D}$ | T | F(found) | F(calc.) | Error | Ash | P(found) | P(calc.) | Error | S(found) | S(calc.) | Error |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1. | 35·2 | 34·00 | 12·88 | 3·00 | 3·11 | ·11 | ·88 | 4·21 | 4·46 | ·25 | 4·59 | 4·54 | – ·05 |
| 2. | 40·7 | 39·11 | 11·76 | 1·05 | 1·01 | – ·04 | ·92 | 4·43 | 4·25 | – ·18 | 5·18 | 5·54 | ·36 |
| 3. | 23·3 | 22·77 | 10·47 | 3·59 | 3·63 | ·04 | ·61 | 2·91 | 2·93 | ·02 | 3·30 | 3·34 | ·04 |
| 4. | 39·2 | 37·72 | 13·90 | 3·06 | 3·13 | ·07 | ·90 | 4·44 | 4·57 | ·13 | 5·50 | 5·37 | – ·13 |
| 5. | 31·4 | 30·44 | 12·51 | 3·77 | 3·60 | – ·17 | ·86 | 3·46 | 3·30 | – ·16 | 4·27 | 4·58 | ·31 |
| 6. | 37·3 | 35·96 | 16·61 | 5·94 | 5·79 | – ·14 | ·88 | 3·98 | 3·84 | – ·14 | 5·85 | 5·91 | ·06 |
| 7. | 35·6 | 34·38 | 15·47 | 5·24 | 5·20 | – ·04 | ·86 | 4·11 | 3·93 | – ·18 | 5·29 | 5·44 | ·15 |
| 8. | 34·7 | 33·53 | 15·52 | 5·30 | 5·43 | ·13 | ·83 | 4·01 | 4·38 | ·37 | 4·96 | 5·01 | ·05 |
| 9. | 36·7 | 35·40 | 15.80 | 5·15 | 5.24 | ·09 | ·85 | 4·35 | 4·41 | ·06 | 5·22 | 5·39 | ·17 |
| 10. | 34·5 | 33·35 | 15·86 | 5·79 | 5·76 | – ·03 | ·86 | 3·93 | 3·94 | ·01 | 5·01 | 5·27 | ·26 |
| 11. | 35·7 | 34·47 | 16·35 | 5·91 | 5·91 | — | ·86 | 4·12 | 4·10 | – ·02 | 5·18 | 5·48 | ·30 |

The whole of these determinations were made very carefully—in duplicate in many cases—by two chemists, the maximum differences being for G ·1, for T ·08, for F ·06, for P ·05, for S ·02, and for A ·04, and for that reason have only these results been used for calculation of the formula, but its correctness has been abundantly proved by other analyses. The probable error between fat found and calculated is $\pm$ ·08, between proteids found and calculated $\pm$ ·14 and between sugar found and calculated $\pm$ ·18. The average calculated amount of proteids is ·01 too high, while the calculated sugar averages ·14 too high. This difference is due to the fact that the milk contains other constituents, and are not sufficiently large, seeing that a very great agreement cannot be expected in this case, to induce me to change the formula.

The figures for the influence on the density of one gram of fat and solids not fat respectively, and for their density in solution, have been calculated as follows from the formula, and are:—

| | Influence on Density. | Density in Solution. |
|---|---|---|
| Fat ... ... ... | — ·708 | ·934 |
| Solids not fat ... ... | 3·705 | 1·589 |

The average percentage composition of the solids, not fat, is:—

| | |
|---|---|
| Proteids ... ... ... ... | 40·8 |
| Ash ... ... ... ... ... | 8·2 |
| Sugar ... ... ... ... ... | 49·5 |
| Other Substances ... ... ... | 1·5 |

Showing a proportion of 6 : 5 : 1 for Sugar, Proteids, and Ash respectively.

2. **The Estimation of Iodoform.**—When Iodoform is heated with alcoholic soda it is split up with the formation of Sodium Iodide, Sodium Formate and other substances; the proportions appear to be that $16CHI_3$ require $42NaOH$, and give 35 NaI and $4KHCO_2$; the estimations made were as follows: for 100 parts Iodoform:—

| | Found. | Calculated from above proportions. |
|---|---|---|
| Soda | 26·4 | 26·6 |
| Iodine as Iodide | 69·3 to 70·4 | 70·2 |
| Formic Acid | 3·34 | 2·92 |

These figures show that the re-action is a complex one, and I have not attempted to construct an equation to express the changes which take place; with the assumption that for every 100 parts of Iodoform 70 parts of Iodine are produced as Iodide, a fairly reliable method of working is possible; about ·1 — ·15 gram of Iodoform, or such quantity of the substance to be examined as will give that quantity, is weighed out and dissolved in alcohol, an excess of alcoholic soda is added, and after about ten minutes' digestion near the boiling point of the alcohol, the excess of alcohol is evaporated; the residue is taken up with water, made slightly acid with *dilute* nitric acid and a small quantity of calcium carbonate added to restore neutrality. The solution is then titrated with the solution of nitrate of silver used for water analysis (of which 1 c.c. = ·005418 gram Iodoform), an excess of about ·3 c.c. is required to produce a good end reaction with chromate of potash and this should be subtracted.

The following test analyses show the reliability of the method:—

| | | | | |
|---|---|---|---|---|
| ·126 grs. Iodoform took | 23·4 c.c. Silver Solution | = ·1268 grs. | or | 100·1 % |
| ·141 „ „ „ | 25·75 „ „ | = ·1395 „ | or | 99·0 „ |
| ·0995 „ „ „ | 18·5 „ „ | = ·1002 „ | or | 100·7 „ |
| 2·203 „ of an 8·5% mixture took | 34·6 „ „ | = ·184 „ | or | 8·4 „ |
| 1·8385 „ „ „ „ | 29·6 „ „ | = ·1575 „ | or | 8·5 „ |

The method does not take more than about half an hour to perform, and is therefore practical. Should the iodoform be obtained in ethereal solution, as for instance, in the estimation of acetone, the ether need not be evaporated, but can be mixed directly with the alcoholic soda. No danger of loss of iodoform need be feared, and it is not necessary to use an inverted condenser.

3. **The Testing of Petroleum.**—For testing petroleum in hot climates I have found that the differences owing to the higher temperatures in the flash point may be almost entirely done away with by cooling the bottle containing the sample, before it is opened, down to a low temperature, say 10°, for about an hour before the test is taken. Thus, samples of petroleum gave the following flash points:—

| | | | | | |
|---|---|---|---|---|---|
| Temperature of air | 15° C | 18·5° | 22·5° | 24·5° | 25·0° |
| „ „ | 29° C | 18·5 | 22·5° | 24·0° | 24·5 |

By burning petroleum in an ordinary lamp, and observing the loss of weight, and

testing the petroleum at each 5 per cent., I find, on the average, that the flash point is raised 2° for each 5 per cent. lost up to about 25 per cent., when the rise in the flash point becomes slightly less. As the lamp burns lower down the space becomes more and more filled with air, but there is less tendency to ignite. When half has burnt away, there is a flash point of from 15° to 18° higher than at the commencement.

When petroleum is distilled, at a certain temperature it "cracks" or decomposes. By cautious fractional distillation, this point may be determined with very fair exactitude. I use a flask of about 150 c.c. capacity, with a neck six inches long up to the side tube, and distil at the commencement with a small flame, just sufficient, so that the distillation will nearly stop at 150°. I then increase the flame, so that the distillation nearly stops at 270°. I then again increase it slightly till the temperature, after rising steadily, suddenly goes down 20° or so, and remains there. This point I call the cracking point: it is usually about 300°, but with good petroleums may be higher.

I quote two experiments in duplicate, to show how exact the results are:—

| | | | | |
|---|---|---|---|---|
| Below 120° | 3% | 2½% | 1% | ½% |
| From 120°—150° | 16 | 15 | 13½ | 13 |
| 150 — 270° | 52½ | 51½ | 57 | 57 |
| 270° to cracking pt. 295° | 70½ | 70 (c. p. 297°) | 72½ | 69 |

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**The Determination of Silica in Substances containing Fluorine. W. Hampe.** (*Chem. Zeit.* 1891, xv. 1521, 1522.)—The determination of silica, in minerals containing fluorine, can be effected in the manner prescribed by Berzelius, or by the method used by Rose, or by the one elaborated by Fresenius and Hintz. Berzelius opens up the substance by fusion with soda, dissolves out the melt with water, and determines the silica both in solution and in the residue. Fresenius and Hintz in their process, which is specially designed for testing cryolite, decompose the substance by heating with strong sulphuric acid in a lead tube in a stream of dry air, and receive the hydrofluoric acid and the silicon fluoride which are evolved in ammonia. The contents of the lead tube are then extracted with water, and the residue attacked by fusion with soda. The further treatment of the fusion is in accordance with that obtaining in Berzelius' method.

In the case of a substance containing both silica and fluorine, which cannot be opened up either by fusion with sodium carbonate or caustic soda, nor by heating with strong sulphuric acid, neither the process of Berzelius nor that of Fresenius is available. The principle of the latter may be retained by using a platinum apparatus of such construction, that the substance may be fused in it with potassium bisulphate, and the evolved silicon fluoride quantitatively absorbed. The construction of such an apparatus, however, presents difficulties.

Since the determination of silica in strongly-ignited alumina containing fluorine,

which cannot be attacked either by sodium carbonate or by sulphuric acid, is of much technical importance in the manufacture of aluminum, the following process has been devised by the author.

0·5 to 1 grm. of the substance is fused with 8 to 10 times its weight of anhydrous borax, free from silica. The finely-powdered borax is placed in a thin layer at the bottom of a platinum crucible and pressed down; an intimate mixture of the weighed portion of substance with borax is then added, the whole covered with a fresh layer of borax, and fused for about twenty minutes. A perfectly clear melt results. The melt is poured into a platinum basin, covered while cooling with the crucible in which the fusion has been conducted, and treated with hot water until both the main portion and the residue in the crucible are thoroughly disintegrated, a process which takes as a rule a couple of days. Half as much ammonium chloride as the weight of the borax originally taken, is then added to the contents of the platinum basin, the mixture warmed until it no longer smells strongly of ammonia, and the silica, together with aluminium and possibly calcium borate, filtered through a platinum or caoutchouc funnel and well washed. The filtrate is evaporated to dryness in a platinum basin, heated to a temperature somewhat above 100° C., and dissolved again in water. The solution is acid in reaction from the presence of boric acid, and possibly also of hydrochloric acid, which have been liberated by the dissociation of ammonium borate, or ammonium chloride, during the evaporation. It is made slightly alkaline with ammonium carbonate and the precipitate filtered off. The filtrate is again evaporated and the operation repeated until no further precipitate is obtained. The combined precipitates are dried, the filter paper ignited, and the whole fused with four times its weight of sodium carbonate; the melt treated with excess of hydrochloric acid, evaporated to dryness, taken up with dilute hydrochloric acid, and the silica filtered off. As in all silicate analyses, in order to obtain an exact determination of silica, it is necessary to evaporate the filtrate again to dryness, treat once more with hydrochloric acid and water, and ascertain whether any further trace of silica has been thus separated. (Note by Abstractor. It is well known that where the filtrate from the silica is not needed, its separation can be effected by evaporation with sulphuric acid rather than with hydrochloric acid, the quantity left in solution being inconsiderable when the former is used; the need for repeated evaporation is thus obviated.)

The purity of the silica is ascertained, after weighing, by treatment with hydrofluoric acid in the usual manner.

The following experiments were carried out in order to make sure that an exact determination of silica was practicable even in the presence of a large quantity of fluorine: selected pieces of pure cryolite were powdered and examined for silica, then mixed with a weighed quantity of silica prepared from a silicate, and the mixture analysed by the foregoing process. No ponderable quantity of silica was found in the cryolite used; in the test analysis the quantity of silica recovered was within a few

milligrams of that added. Thus 0·6142 grms. of cryolite were taken, and 0·5135 grms of silica added; the silica found amounted to 0·5100 grms.

A sample of ignited alumina containing fluorine gave the following results:

| | (1) | (2) | (3) | Average. |
|---|---|---|---|---|
| Silica ... | 3·95% | 3·79% | 3·98% | 3·907% |

A determination of the contents of aluminium was also made as a check. For this purpose the substance was fused with potassium bisulphate, whereby a portion of the silica, corresponding to the amount of fluorine present, was volatilised as silicon fluoride. The melt dissolved clear in dilute sulphuric acid. The solution was evaporated until fumes of sulphuric acid were given off, by which means a part of the silica was rendered insoluble. After cooling, water was added, and the solution filtered. The filtrate may be termed A and the residue B. The residue B was then treated as in the analysis of the silicate, that is fused with soda, etc. The filtrate from the pure silica thus obtained gave with ammonia a small precipitate of alumina. The filtrate A was precipitated with ammonia the usual precautions being observed, the precipitated alumina and silica filtered off, dried, ignited, and fused with sodium carbonate. The melt was dissolved in hydrochloric acid, the solution evaporated to dryness, the residue treated with strong hydrochloric acid, the silica remaining undissolved filtered off, and the alumina precipitated with ammonia in the filtrate. Both portions of silica from A and B were examined as to purity after weighing. The results were:

| | |
|---|---|
| Total alumina from A and B ... | 95·50% |
| „ silica „ „ ... | 3·08% |

The quantity of silica volatilised as silicon fluoride by fusion with potassium bisulphate was therefore 3·907 − 3·08=0·827%. From these data the amount of fluorine in the substance may be calculated as 1·051% and the complete composition as follows:

| | | |
|---|---|---|
| Alumina | 94·563% | |
| Aluminium fluoride | 1·548% | Aluminium = 0·497%<br>Fluorine = 1·051% |
| Silica | 3·907% | |
| | 100·018% | |

B. B.

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**The Action of Water on Glass Vessels for Chemical Use. F. Mylius and F. Foerster.** (*Zeits. Instrumentenk.* 1891, xi. 311. *Through Chem. Zeit.*)—The authors have already shown that the greater part of the matter dissolved out of glass by water consists of alkalies, and the quantity of alkali dissolved is a measure of the quality of the glass. When the quantity is greater than 0·1 of a mg., it can be directly determined by titration with $\frac{n}{1000}$ sulphuric acid. Smaller quantities are best estimated by

shaking with an ethereal solution of eosin, which becomes red, the intensity of the colour being proportional to the amount of alkali present. The comparison of one glass with another can be effected by treating the vessels to be tested with water at 20° C. for three days, in order to bring their surfaces into a normal condition, emptying them and allowing them to be acted upon for a second period of three days by pure water prepared by re-distilling ordinary distilled water with a little sulphuric acid to retain the traces of ammonia that are otherwise invariably present. The alkalinity of the water that has been in contact with the glasses to be tested is then determined in the manner described above.

As the result of their observations the authors come to the following conclusions:—

1. The action of cold water upon glass is at first very rapid, but its rate rapidly decreases; the retardation is due to the production of a layer of glass that has been already extracted, and is but slightly permeable.

2. The strength of the attack of water on glass is influenced by its condition as regards disintegration or exfoliation.

3. The relative attackability of the same glass varies according as hot or cold water is used.

4. The process of boiling out a glass vessel is of great utility, though its usefulness is diminished if the glass be bad.

5. Glass surfaces have the property of absorbing alkali from solution and retaining it in spite of ordinary rinsing; long contact with water is necessary to remove it. B. B.

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**The Coloration of Preserved Foods with Copper. Tschirch.** (*Read at the 64th meeting of the Deutsch. Naturforsch. u. Aerzte. Through Chem. Zeit.*)—The time-honoured method of imparting a beautiful green colour to preserved foods consists in treating the articles to be colored with a solution of copper sulphate, which is quickly poured off and the last traces removed by repeatedly washing with water; the preserved articles are then boiled and the vessels containing them soldered up. The colouration results from the formation of the copper salt of an acid derived from phyllocyanin. This body is very inert, is insoluble in water, hydrochloric acid and acetic acid, soluble in alcohol, and indifferent to the action of light. As the quantity is quite small, only a few milligrams in 100 grams, the author is disposed to tolerate the practice. B. B.

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**The Valuation of Oil of Cloves. H. Thoms.** (*Read at the 64th meeting of the Deutsch. Naturforsch. u. Aerzte. Through Chem. Zeit.*)—The value of oil of cloves for medicinal purposes depends wholly on its content of eugenol, while for the purposes of the perfumer regard must also be had to the amount of sesquiterpene present. The method used by the author for the determination of the former is based upon the production of benzoyl eugenol, $C_{10}H_{11}O_2 \cdot C_7H_5O$. In a preliminary experiment with pure eugenol 99·25 per cent. of the theoretical quantity of the benzoyl derivative was obtained. When sesquiterpene is present, as in oil of cloves, the process is carried out as follows: 5 grms. of the

sample are treated with 20 grms. of caustic soda solution [15 per cent.] and 6 grms. of benzoyl chloride added; the mixture vigorously shaken, during which operation a considerable amount of heat is evolved, allowed to cool, 50 c.c. of water added, heated until the crystalline ester has become liquid, and again allowed to cool. The aqueous liquid is then filtered off and the residue repeatedly washed with water, heating and cooling at each washing. The removal of the sesquiterpene is effected by treating the crystalline mass with 25 c.c. of 90 per cent. alcohol, heating on the water bath, shaking well to break up the cake, cooling to 17° C., filtering and collecting the filtrate in a graduated cylinder. The total bulk of the filtrate and washings should be 25 c.c. The precipitate of benzoyl eugenol is dried at 100° C. to constant weight. A correction 0·55 grms. for the benzoyl eugenol dissolved by the alcohol must be made. Calling (a) the amount of the benzoyl found and (b) the quantity of oil of cloves taken, the percentage of eugenol in the sample is represented by the expression:— $\frac{4100\ [a+0{\cdot}55]}{67b}$.

The examination of a large number of samples of oil of cloves showed that the content of eugenol varied from 76·8 -90·64 per cent. It further appeared that the specific gravity rose and fell with the percentage of eugenol. The author also found that oil obtained from the stalks of the plants yielding oil of cloves, containing 83·2 and 84·88 per cent. of eugenol, had the low specific gravities of 1·059 and 1·062. He is, therefore, of opinion that oil from this source which has hitherto been accounted of little worth, has been undervalued, and that its low specific gravity is due to the presence of some substance other than the eugenol and sesquiterpene present in normal oil.

B. B.

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**A New Process for the Determination of Phenol. L. Carre.** (*Compt. Rend.*, 1891, cxiii., 139, through *Chem. Zeit.*).—The process depends on the conversion of phenol into picric acid, and the colorimetric estimation of this body by means of its sodium salt. 10 grammes of pure phenol are weighed, made up to 1 litre, and from this solution others containing 5, 4, 3, 2, 1, 0·8, 0·6, 0·4, 0·2, 0·1 grammes of phenol per litre prepared. 25 c.c. of the solution containing the phenol to be estimated, taken after dilution if necessary, are heated with 5 c.c. of nitric acid in a small flask on the water bath for 1—2 hours, the standard being treated in precisely the same way; a preliminary trial shows which of the standard solutions approximates to the sample being tested. In order to obtain greater accuracy 20 c.c. of soda solution are added to the contents of the flask after heating, the liquid made up to 50 c.c., filtered, and compared in the colorimeter with the standard to which it is nearest in tint. The use of concentrated solutions should be avoided. Should the liquid in which the phenol is to be estimated contain a little alcohol it is best to heat for some time after the addition of nitric acid; in the event of a considerable quantity of alcohol being present, it must be diluted to avoid the formation of ethyl nitrite. When impure phenol is to be estimated, the heating must be prolonged to decompose the accompanying tarry matter. B. B.

**The Eschka Method of Determining Sulphur in Coal.** J. Rothe. (*Mitt. König. tech. Versuchs.*, 1891, ix., 107, through *Chem. Zeit.*).—Eschka's method consists in heating 1 grm. of coal with 15 grms. of a mixture of two parts by weight of magnesia and one of dry sodium carbonate in a 30 c.c. platinum crucible, placed in a sloping condition, so that only the lower part is red hot. The mixture is stirred two or three times in the course of an hour, at the end of which time the coal is fully burned off. Solution in hydrochloric acid, oxidation with bromine, and precipitation with barium chloride completes the operation. The author finds that no loss of sulphur occurs, and that, where several determinations have to be made, porcelain crucibles heated in a muffle for 20—30 minutes can be advantageously substituted for the platinum crucible and the bunsen burner. B. B.

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**The Recognition of Arsenic.** J. Thiele. (*Liebigs Annalen*, 1891, cclvi., 55, through *Chem. Zeit.*).—Arsenic in whichever state of oxidation it may be, can be recognised in the presence of antimony and tin by strongly acidulating the solution containing it with hydrochloric acid, and adding at least 1 gram. of sodium hypophosphite to 10 c.c. of solution. On warming in the water-bath, the arsenic is precipitated as a brown or brown-black powder. Very dilute solutions need heating for thirty minutes, and a coloration instead of a precipitate may be produced. The reaction does not take place in solutions acid with sulphuric acid in the absence of a halogen acid. Its sensitiveness is increased by the addition of a crystal of potassium iodide, 0·025 mgram. of arsenic being detectable, whereas the limit in the absence of the iodine is 0·05. The "noble metals" and copper must be absent; bismuth and antimony are only precipitated in strong solutions; the addition of potassium iodide should be omitted if the former be present, on account of the strong yellow colour of bismuth iodide. In the presence of much iron the solution should be covered to prevent free access of air, as otherwise it will become yellow. A separation of antimony and arsenic cannot be based on this reaction, as the precipitate is too easily oxidisable.

In using Marsh's test, the addition of platinum chloride to aid the solution of the zinc should be avoided, as arsenic is retained thereby apparently as an arsenide of platinum (?)

According to Brauner and Tomiczek, arsenic is precipitated as pentasulphide from a warm acid solution of arsenic acid, when a rapid stream of sulphuretted hydrogen is used. With a slow stream a mixture of $As_2S_5$ and $As_2S_3$ comes down. A cold solution in strong hydrochloric acid gives a mixture of $As_2S_5$, $As_2S_3$ and S, and a rapid stream of the gas, if diluted, gives the same result as a slow stream. B. B.

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**Desiccators.** W. Hempel. (*Pharm. Centr.*, 1891, xii., 453, through *Chem. Zeit.*).—The author lately advanced the view that the drying material in a desiccator was more effective when placed above instead of below the substance to be dried, a conclusion which was contested by Biltz. He now finds that in the case of desiccators, large in

proportion to the vessel containing the substance to be dried, and supplied with a considerable quantity of concentrated sulphuric acid in proportion to the amount of water to be absorbed, the time occupied in drying is but little shortened, but that under contrary conditions the process is much hastened. Thus 10 c.c. of water in a dish, large in proportion to the desiccator, were absorbed by 25 c.c. of sulphuric acid in three and a half days when the acid was placed above the water, while when placed below the time was six and a quarter hours. B. B.

**Examination of Peppermint Oil. H. Andres.** (*Pharm. Zeits. Russ.*, 1891, xxx., 417, through *Chem. Zeit.*).—Commercial samples of peppermint oil differ in quality as well as in composition. The determination of the iodine number is a useful means of discrimination, being smaller, the richer the oil is in menthol, the chief active constituent of the oil. The following are some figures thus obtained:—English, 52·9, German, 69·7, American, 72·3, and Russian, 96·8. B. B.

**Examination of Tanning Extracts. F. Jean.** (*Moniteur Sci. Quesneville*, 1891, **59J**, 918.)—In a paper which describes a new apparatus for extracting tannins from tanning-stuffs, of technical interest only, the author lays down that the analysis of a tanning extract should include the determination of (1) the specific gravity, both absolute and in degrees Beaumé, (2) the matter insoluble in cold water, which should not exceed 2 per cent. except in quebracho extract which may be allowed to contain 3—4 per cent., (3) acidity due to organic acids and that due to mineral acids, (4) contents of tannin and of gallic acid, (5) matter absorbable by hide, (6) extractive matter, (7) heavy adulterants added to increase the specific gravity.

As the value of a tanning material largely depends upon the colour which it will impart to the leather, those materials being most valuable which occasion the least departure from the buff of oak-tanned leather, the author aims at obtaining some evidence on this point. He immerses cuttings of parchment or unhaired skin, previously plumped in water, in a solution of the extract at $\frac{1}{2}^{\circ}$ Beaumé for 30 hours, the liquor being changed at the end of the first 12 hours; the samples are then exposed to the air and compared with standard samples, similarly treated in known extracts.

A. G. B.

**A Delicate Test for Alum in Potable Water. Ellen H. Richards.** (*Technology Quarterly*, iv., 194–195.)—To 25 c.c. of the water (concentrated from one litre or more, if necessary), are added a few drops of freshly-prepared logwood decoction; any alkali is neutralised and the colour brightened by the addition of two or three drops of acetic acid. By comparison with standard solutions the amount of alum present may be determined. It is said that 1 part per million of alum can be detected with certainty in this way. The logwood chips must be treated with boiling water two or three times before finally extracting for the colour, as the first extraction gives a yellow colour, the third or fourth a deep red. A. G. B.

**The Use of Potassium Ferrocyanide and Ferricyanide in Analysis. C. Luckow.** (*Chem. Zeit.* 1891, xv. 1491, 1492.)—The author being alive to the objections to the use of potassium ferrocyanide in such analytical operations as the determination of zinc, has turned his attention to the question of the availability of potassium ferricyanide for like uses, and records the following facts.

Zinc can be determined in a solution acidulated with nitric or acetic acid, with exactitude, even in the presence of lead, by means of potassium ferricyanide, either gravimetrically or volumetrically, while the lead can be estimated in the filtrate in a similar manner by potassium ferrocyanide. Stannic oxide can be determined by potassium ferrocyanide in the presence of antimonic acid and arsenic acid in a solution which has been evaporated with oxalic acid, a little dilute sulphuric acid having been added subsequently.

In carrying out such operations it must be remembered that potassium ferrocyanide is liable to contain, besides sulphates and chlorides, sodium salts, as pointed out by L. Blum. This is of no importance if the solution be standardised upon a metallic solution of known value, always provided that the solution to be titrated contains no metal capable of yielding a precipitate with either of the first-named impurities. In the contrary case, as well as in those instances where it is required to determine the composition of the precipitate from the amount of potassium ferrocyanide solution used, a perfectly pure salt is necessary: the like is true of potassium ferricyanide. Potassium ferrocyanide is stable in the dry state, and its solutions are unaltered by cautious evaporation. Daylight, and especially direct sunlight, appear, however, to act slightly upon its solutions as noted by Moldenhauer, who adds a small quantity of caustic potash to preserve them. Potassium ferricyanide is more sensitive to the influence of temperature and light than ferrocyanide, on which account it is kept in brown glass bottles, both when it is in the solid state and in solution, and should be subjected to no higher temperature than 50°—60° C. when recrystallised. The cautious addition of chlorine suffices to convert any ferrocyanide that may be present into ferricyanide. The purity of a solution of potassium ferricyanide may be proved by the addition of a solution of an uranium salt, which gives a red-brown coloration should ferrocyanide be present, or of a lead salt which gives a white precipitate in the same contingency.

The volumetric determination of various new metals by means of potassium ferrocyanide and ferricyanide must be effected with the aid of some external indicator.

Of these, there are two classes, the first being those which indicate whether the metal, being titrated, is completely precipitated or not, while the second are such as react with an excess of the precipitant. Among the first are the alkaline sulphides, and the ferrocyanide and ferricyanide; for metals which give brown-black or black precipitates with alkaline sulphides, a mixture of a pure zinc salt with ammonia, ammonium sulphide, and a little rosolic acid or similar colouring matter may be used; the function of the rosolic acid is to make the edge of the streak made on the paper used in carrying out the test more easily discernible. To the latter belong substances which give a brightly

coloured precipitate with ferro- and ferricyanides; such are ferric and cupric salts for the former, and ferrous and cobalt salts for the latter. The author has found cupric acetate acidified with acetic acid, or ammonium ferrous sulphate to which a little ferric chloride has been added, useful for these purposes. The solution to be titrated should in general measure 20 to 30 c.c. and contain 0·1 to 0·15 grm. of the metal to be determined. When it is desired to filter off the liquid from which a metal such as zinc has been precipitated by a solution of known strength, and to determine the excess of the precipitant in the filtrate, it will be found advisable to use potassium ferricyanide rather than ferrocyanide in many cases; the precipitates produced by it filter more easily. B. B.

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**The Coloring of Preserved Foods. A. Tschirch.** (*Schweiz. Wochenschr. Pharm.* 1891, xxix. 344, through *Chem. Zeit.*).—The green coloring matter of leaves, etc., is extremely sensitive both to light and to acids of every kind. In order to hinder its decolorisation, sodium carbonate is commonly added to green vegetables before cooking, by which treatment free acids are neutralised, and also such salts as potassium acid-oxalate. Not only is the action of the acids upon the chlorophyll thus prevented, but a relatively stable sodium salt, green in colour, is formed, enhancing the effect. The question of the coloring of preserved foods by means of copper sulphate has also been investigated by the author, and the conclusions he arrived at recorded in The Analyst, xvi., 200. B. B.

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**The Use of Calcium Sulphate in Dialysis. G. Morales.** (*Amer. Journ. Pharm.* 1891, lxiii. 425, through *Chem. Zeit.*).—Herrera suggested years ago the use of dried calcium sulphate in dialysis, the solution to be dialysed being hung in parchment paper in a mass of the powdered substance; the colloids remain in the parchment paper vessel and the water and the crystalline substances pass into the plaster. The method can well be used for the extraction of organic acids from their solution, and in a similar manner, for alkaloids. The author has tried the process for obtaining the alkaloids from opium with but little success, and considers it unsuited for quantitative determinations, although available for qualitative examinations. B. B.

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**Poisonous Metals in Preserved Foods. W. Reuss.** (*Chem. Zeit.* 1891, xv. 1522, 1523 *and* 1583.)—The fact that the amount of lead in the tin coating of vessels for preserved foods, and that in the solder with which they are united, have been limited by law in Germany to 1 per cent. and 10 per cent. respectively, has caused the adoption of vessels closed without a soldered joint, a rubber ring being substituted instead. The

author having observed that preserved foods contained in vessels of this description which appeared unexceptionable, were often contaminated with lead, has examined into the cause of its presence, and finds it to be due to the rubber ring employed.

The following examples are chosen from among the figures quoted by him: (1) Indiarubber rings made in Paris and used by a large German firm, (*a.*) average weight of ring, 0·5 grm.; ash 66·6 per cent. consisting almost wholly of red lead; no antimony sulphide was present. (*b.*) An experiment was made by exposing a rubber ring to water under pressure at a temperature of a 110° to 112° C. for thirty minutes; at the end of this time the ring was found to be much softened and 0·0286 grms. red lead (misprinted $Mn_3O_4$ in original) was suspended in the water, which contained no lead in solution. (*c.*) Another ring was similarly treated in the presence of 0·5 kilo. of asparagus. The solution gave an immediate precipitate of lead sulphate on the addition of sulphuric acid; the quantity of lead in solution corresponded to 60 per cent. of the total amount in the ring. (2) Indiarubber rings taken from tins of Australian meat from a large English firm had the same composition as those mentioned under (1). (3) Red rubber rings from Vienna contained 63 per cent. of ash, the bulk of which was red lead. (4) Red rubber rings from a German factory gave similar results, save that a little antimony sulphide was present. (5) Numerous analyses of rings from other German firms gave similar figures.

In view of these facts the author is interesting himself in the manufacture and use of rings of a less poisonous character. B. B.

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**Porcelain Water Baths. W. Dittmar.** (*Chem. Zeit.* xv. 1891, 1467.)—Ordinary copper water baths easily become corroded, and are difficult to keep in a presentable state. The conventional hemispherical variety of porcelain water baths, which used to figure in chemical lists, has never been popular, presumably on account of their supposed fragility, and now appear to be driven out of the market. Kaehler and Martini, of Berlin, have supplied the author with a porcelain water bath of practical utility, consisting essentially of a cylindrical porcelain jar, with a set of concentric rings, also of porcelain, and provided with a tubulus near the bottom, by which connection is made with a constant feeding arrangement, consisting of an inverted flask of water dipping into a small cylindrical vessel coupled direct to the tubulus. The bath is heated by a common ring burner, and is in no way liable to fracture, if reasonable care be taken of it. Evaporations can be conducted in a dust-free atmosphere by the addition of a simple fitting, consisting merely of a glass shade, such as is used for statuettes and the like, resting on a V-shaped gutter having an exit tube attached to it, which carries off the water allowed to flow on the top of the glass shade. This is distributed evenly by means of a couple of strips of paper placed crosswise. B B.

## LEGAL.

## IMPORTANT DECISION ON A CASE OF MILK ADULTERATION.

(From the *Times*.)

Queen's Bench Division. (Before Lord Coleridge and Mr. Justice Wright.)

Dyke, Inspector for the Vestry of St. George's, Hanover Square, Appellant.

Gower, Respondent.

This case raised an important question under the enactment in the Adulteration Act of 1875 with respect especially to the adulteration of milk. It was an appeal against a refusal by Mr. de Rutzen to convict under the Act a milkseller who had sold milk from which 33 per cent.—one third—of the fatty matter or cream was abstracted, the excuse being that it is of the nature of cream to settle at the top or on the surface of the milk, and that as it is taken out by the measures put in to serve the earlier customers, the milk is necessarily impoverished for the later customers. The question was whether this was an excuse under Section 9 of the Act, which runs in these terms :—" Any person who shall, with intent that the same shall be sold in its altered state, abstract from it any part so as to affect injuriously its quality, substance, or nature, and any person who shall, without notice, sell any article so altered, without making a disclosure, shall," &c. In the present case the question arose whether the selling must be with the intent previously mentioned. It had arisen under these circumstances. The defendant was a milkman, and an officer appointed by the vestry went to his shop and purchased some milk, which being analysed, it was found that 33 per cent. of the fatty matter had been abstracted. Upon the summons this was not denied, but it was urged that it was accounted for by the way in which the milk was sold. It was received in a large vessel, a churn, containing 16 gallons, and it was dealt out to customers in quart or pint measures, and as the cream tended to settle at the top of the milk as the milk was thus taken out, unless it was kept constantly mixed the later customers would find the quality of the milk deficient. The magistrate so found and considered the case sufficient, and so refused to convict, and dismissed the complaint. The vestry appealed, and he stated a case.

Mr. M'Call, Q.C. (with Mr. Arthur Gill and Mr. Stephenson), appeared on their behalf and argued in support of their appeal. The magistrate, he said, was wrong in his view and ought to have convicted. He mistook the scope of the enactment, the object of which was to throw upon the defendant the onus of showing a defence. The second part of the enactment is distinct from the first. [Lord Coleridge.—But the intent in the first part is to be imported into the second?) It is conceived that it is not. If that view be adopted and this defence is supported, as it can always be set up, the object of the enactment will be defeated. [Mr. Justice Wright.—You have not alleged the milkman's knowledge of the deterioration.] Upon the view submitted to the Court it was not necessary to allege it, and the information was so framed as to raise the question. It is one of great interest and importance under the Act, for the practical efficiency of the enactment entirely depends upon it. There is no defence allowed under the Act except a purchase by seller under a warranty, unless there has been a disclosure. He cited " Webb

v. Knight," 2 Q.B.D. 530; "Payne v. Boughtwood," 24 Q.B D. 353; "Betts v. Armistead," 20 Q.B.D.

Mr. D. Hart, on the part of the milkseller, the defendant, said he quite agreed that the question raised in this case was one of great public interest and importance with reference to the sale of adulterated articles of food, and especially as to milk. It is not alleged that the milkseller knew of the deterioration of the milk sold, and unless he knew of it, how can he make a disclosure of it? There must be the intent to sell an article deteriorated in quality. [Lord Coleridge.—The intent is quite indifferent to the purchaser, and how can he dive into the man's mind and show his intent? If the alteration in the article is once made, then the sale of it is surely the offence? The seller knows of the alteration, and he sells the article, knowing the alteration. Is that not selling with intent to sell the article as altered?] It is submitted that that is not the meaning of the section ("Nicholls v. Hall," 8 Law Reports, C.P. 322.) [Lord Coleridge.—But how can you get over the decision in "Payne v. Boughtwood," 24 Q.B.D. 353—that a person selling the altered article could be convicted, though at the time he did not know of the alteration?] It is submitted that it is distinguishable, and that it is of no authority, as it was only argued on one side. No attempt was made in that case to show how the alteration came about. [Lord Coleridge.—That distinction is rather against you, for in this case it is known how it happened and the milkseller must have known of it.] That does not appear. [Lord Coleridge.—Can you contend that a milkseller does not know that cream settles on the surface?] Unless it is kept stirred up. [Lord Coleridge.—And it was not sold so stirred up.] That is not stated. [Lord Coleridge.—But the very defence set up shows that it is so, and that the defendant knows it is so.] If that view be taken the milkman may always be convicted. [Lord Coleridge.—If it does not prevail he never can be convicted. He may take off all the cream and sell the impoverished milk, and then say, "Oh, it has been taken by earlier customers." This Act is intended if possible to secure to the people pure milk, and if your view be adopted the object of the Act will be defeated.]

The Court came to the conclusion that the magistrate was wrong, and ought to have convicted.

Lord Coleridge, in giving judgment, said:—We think the magistrate was wrong. The case shortly stated was this. The milkseller has bought milk which we will assume has come to him pure and good. He puts it into a large vessel from which he sells it out in smaller quantities. It is stated in the case that unless the milk is kept stirred there is a tendency of the cream to rise to the top, and so leave the milk below deprived of the richer element. The milkseller knows this, and he sells the milk in that condition. Possibly he may not gain by this if he sells the upper and richer portion of the milk at the same price as the lower and poorer portion. But the Act is passed for the benefit not of the seller but of the buyer, and to secure, as far as legislation can secure it, that he shall have genuine milk with its due proportion of the richer element. Now here it is admitted that—I do not say fraudulently, but by the operation of a known law of

nature—the milk sold to the complainant was 33 per cent. lower in the richer element than it ought to have been. It is obvious that, if the contention of the defendant, the respondent, could prevail, this would inevitably follow (nothing being done to prevent it)—that the upper part of the milk sold would be of a better quality, and that the lower part would be deficient in the richer element to the extent of one-third. And that is, in fact, what happened here, and the question is whether it is an offence under the enactment in the Act (38 and 39 Vict., c. 63, s. 9), which enacts that "No person shall abstract from any article of food any part of it so as to affect injuriously its quality," &c. Now here, undoubtedly, the defendant had, in fact, abstracted from the milk a part of it so as to affect its quality injuriously. Intentionally or not he had done it; and then it is further enacted, "No person shall sell an article so altered by the abstraction of some part of it so as to affect its quality injuriously without a disclosure." And here the defendant certainly had sold the altered article without disclosure. It is said that no offence was committed, because the first part of the clause says that no person shall do it with intent to sell without notice, and that therefore the contention is that, however much a person may have altered the article, yet if at the time he altered it he did not contemplate selling it, he had a right to sell it whatever its state. But that would make utter nonsense of the Act, and would deprive the public of its protection. What does it signify to the purchaser of any article which he finds to be adulterated, with what intent the milkseller altered it? And how can it be material for him to dive into the mind of the seller and show what was passing in it when he made the alteration? It is obvious that the injury to the purchaser and the public is the same, and that such a construction would make utter nonsense of the Act. I should therefore have so held quite independently of the case of "Pain v. Boughtwood," which is directly in point, and appears to have been well decided. I think, therefore, that the magistrate was wrong, and that the appeal must be allowed.

Mr. Justice Wright concurred. If, he said, there could be any doubt if section 9 stood alone, there could be no doubt when it was looked at in connection with previous decisions. It had been held in several cases that knowledge was not material ("Fitzpatrick v. Kelly," 8 Law Reports, Q.B., and "Roberts v. Evans," Law Reports, 9 Q.B.). The Legislature after those decisions and it must be presumed knowing of them, passed the Act of 1875 in terms which they must have contemplated would be decided in accordance with those decisions. Even, therefore, independently of "Pain v. Boughtwood," it would have been held that the defendant ought to have been convicted. Appeal allowed, and case sent back to the magistrate with that intimation.

## CORRESPONDENCE.

Dr. Van Hamel Roos (editor of the *Revue International des Falsifications*) writes us, with reference to the note appended to the abstract appearing on page 195, Vol. xvi. of THE ANALYST, that there is now in the market a varnish for the purpose of protecting tin vessels quite different in composition to any hitherto used, and which, from a number of his own analyses, he finds entirely free from lead. By an improved process, the whole interior of the vessel is coated in such a manner that the food does not come in contact with the solder, absolute protection being thereby ensured.